

CONSIDERATIONS

It should be reiterated that overriding objectives of **this** reconnaissance were to address prescriptions in the Chapman-TPWD Proposal: i.e., maintenance of the Watershed's ecological integrity commensurate with sustained economic development, and support of traditional land uses. Citizen participation in ecologically-related watershed actions are encouraged (Item 6, **Socio-Economics and Traditional Land Uses**).

Ecological Considerations and Land Use

In general, the greater the variety of cover types (cover patchiness) in a given area, the greater the diversity of species. Devegetated mine sites are among the poorest of Watershed cover types. But as components of a diverse cover mosaic, smaller abandoned mine sites provide openings useful to certain wildlife. Size is a factor. A large hay field is less productive ecologically than a number of small fields. Silberhorn et al. (as reported by **Gucinski**, 1978) suggested that, cumulatively, small marshes in a region may trap more sediment than a single large marsh. They stated that any marsh at least two feet average width has significant value as an erosion deterrent, and is capable of filtering sediment. Beaver marshes contiguous to streams, and small marshy sites along the perimeters of reservoirs, provide very beneficial services (Figures 16 and 17). Considering game and **nongame** wildlife, **Beecher** (reported by **Odum**, 1971) found fewer bird nests on a large cattail marsh compared with a similar size area composed of numerous small marshy units. Small **ecotypes** scattered throughout the Watershed influence the dispersal of animals that rely on the particular types. Their dispersal mitigates density related losses associated with concentrations on large areas. Waterfowl are an example. Disease outbreaks are less apt to occur among wild ducks, and **heavy** hunting pressure less likely to be detrimental, when ducks are dispersed throughout a floodplain on small waterbodies. In general, conservation measures that develop diverse cover on large devegetated sites can mollify adverse ecological impacts, and can be ecologically and economically beneficial (see **Socio-Economics and Traditional Land Use**).

There is another Cypress Bayou Watershed cover type to consider which was not evaluated during this reconnaissance. It probably has not been studied as a distinct type in the Watershed. It can be termed "ecotone". Ecotone is the zone of interface between two or more different cover types. It is commonly referred to as "edge". Edge has a linear dimension of varying width, but is narrower than the adjoining parent types. Edge is a good example of synergism. Commonly, edge has plant and animal species found on each parent type. In addition, it may have endemic species. The number and density of species, therefore, may be greater on edge than on either parent cover type (Odum, 1971). A shrub relief across a large meadow constitutes valuable edge. It provides a protective corridor for wildlife to cross as well as habitat for certain edge dwellers (Figure 46). Edge may be more important to some birds than to other wildlife. Odum wrote that within a given region studied, the population density of song birds correlated with the lineal distance of edge. Several species of birds including the northern mockingbird, eastern bluebird, indigo bunting, chipping sparrow, and orchard oriole (all inhabitants of the Watershed) require trees for observation or nesting. Yet, they largely feed near the ground on openings. Good habitat for those species is edge between forest and grassland. Still better habitat occurs where several types adjoin to produce a greater amount and diversity of edge (Figure 47). Game birds, i.e., the northern bobwhite, mourning dove, and eastern wild turkey, require diverse cover in close proximity and including edge.



Figure 46. Shrub-herb covered drainage that provides a protective corridor and edge habitat for wildlife, Gregg County, TX.



Figure 47. Unmowed shrub-herb site, hay meadow, and pine-hardwood forest (background) that provide cover patchiness and edge diversity highly beneficial to wildlife.

Edge is not all good. There are quality and disturbance implications. Quality edge is exemplified in the vast floodplain complex of the eastern Cypress Bayou Watershed. The interspersed of **bottomland** hardwood stands of different ages, **shrub** communities, swamps, ponds, lakes, streams, openings etc., produces a great amount and diversity of edge. Relatively low human disturbance **within this** large wetland continuum augments the quality. Conversely, much edge is created by development-related fragmentation of natural areas. Urban, suburban, and industrial “sprawl” onto rural areas, without development-conservation planning, and the maze of access roads built to accommodate development, produce comparatively low quality edge. The condition is exacerbated by the concomitant **increase** in human **traffic** and associated pollution (Figures 34, 38, 48, 49 and 50). Too much edge encourages “weed” species adapted for co-existing with man. Example species were mentioned under Urban.

Suburban and Industrial Sites. Long-range development planning that includes conservation measures can mitigate poor edge conditions



Figure 48. Low quality edge associated with some development.



Figure 49. Illegal dumping associated with urban sprawl and human traffic often occurs on edges. The pollution that results threatens human health, and reduces the aesthetic and ecological integrity of natural environments



Figure 50. Type of pollution associated with urban-suburban sprawl. Some illegally dumped solid waste contains toxic materials that are introduced into the Watershed.

Socio-Economics and Traditional Land Use

Environmental-developmental initiatives prescribed for the Watershed include options to bolster the economy commensurate with protection of its ecological integrity. Cultural, educational, and recreational pursuits are prescribed. **Ecotourism** is touted. These pursuits portend substantial benefits for the principal population centers, places richest in history and archaeological features, and the more attractive outdoor recreation areas. However, careful planning will be required to avoid perturbations associated with heavy human traffic within natural areas. For much of the rural Watershed, cultural and education centers and substantial income **from ecotourism** may be long in coming. In those areas, options for ecologic-economic improvements commensurate with traditional **rural** land uses seem more applicable. Throughout much of the Watershed, maintenance of the ecological integrity requires little more than protection of present natural conditions. Some areas **need** conservation and enhancement measures. All areas can benefit by bolstering the economy. It is with these conditions in mind that the following suggestions are offered. Some of the suggestions would require aggressive, persistent actions and adjustment in the land management perspective.

- ◆ Abrogate illegal solid waste dumping and effluent discharges into Watershed streams
- ◆ Accomplish revegetation of lignite mining areas with a variety of native cover rather than the establishment of largely non-native grasses. Consider income-producing revegetation enterprises such as nurseries to grow and sell native hardwood trees, wildflowers, wildlife food plants, and food crops. Well managed private wildflower and seed nurseries in the State are successful. Demand for merchantable hardwood trees is increasing concomitantly with hardwood decline. Aside **from** residential planting stock, the need for hardwood products is strong. Nurseries on reconstructed lignite mine sites could be operated by the mining entities, landowners, lessees, or under a cooperative arrangement. Either way portends jobs, income, and upgrading of the Watershed's ecological health. Consider commercial game bird farms and poultry operations on some lignite mined areas to generate income and help restore soil fertility.

◆ Negotiate with iron ore mining entities to restore cover on abandoned mine sites; possibly with plants produced by the above suggested enterprises.

◆ Support current efforts to secure tax advantages for native land restoration and wildlife management, as is done for other agricultural enterprises.

◆ Implement, where applicable, multiple land use enterprises to bolster income. Unmanaged forests used only for hunting might be managed for hunting, rotation grazing of cattle, and timber production. Ramsey (1965), investigating income from deer leases and cattle grazing in the Edwards Plateau of Texas, reported that deer hunting brought more net income to landowners than cattle. However, properly managed together, hunting and cattle enterprises brought more income than either alone. Bond and Campbell (1951), working in southwest Louisiana found a deer-cattle-timber enterprise to be more profitable than timber alone. An evaluation during this reconnaissance suggested that leasing for deer hunting can yield substantially more income than rangeland cattle grazing. One reason is that deer enterprises have very little overhead costs compared with cattle. Proper management of deer and cattle together, however, may bring more revenue than either alone (Table 8).

Traditionally, east Texas landowners have preferred to lease hunting rights by the acre. The preference holds true today, particularly in view of the growing number of non-resident landowners. Currently, \$4 per acre is an average deer lease price in the Watershed (Charles Muller, pers. comm.). In some areas of the state, landowners derive income from hunters based on the animals taken. Depending on their age, sex, and quality, individual deer bring \$200 to \$4,000 in south Texas (Mungall and Sheffield, 1994). A good quality east Texas buck should bring \$500 to \$1,000 or more; young and inferior bucks and does should bring \$200. Charging by the deer necessitates good range management. The better the range is managed, the greater the quality and/or number of saleable animals. Thus, ecological integrity and economics are supported.

Table 8. A representative Cypress Bayou Watershed range, estimated forage yield, optimum cattle and deer stocking, and annual net revenues possible.¹

REPRESENTATIVE 444 AC. RANGE:

Site Type	Acres	Forage D.W. (#/ac./Yr.)	Percent of Forage				
			Grass	Forb	Browse	Mast	Other
Bottomland forest	41	800	21	8	68	3	tr.
Pine-hdwd. upland	163	1,200	28	7	63	2	tr.
Manag. pine forest	125	1,500	52	21	26	1	tr.
Grassland	115	3,500	90	9	1	tr.	tr.

FORAGE AVAILABLE ANNUALLY

(#/ac., d.w.):	130,352	21,575	79,323	4,063	-
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TOTAL FORAGE USED (#/ac., d.w. annu.

@optimum stocking):

Cattle (@9,851#)	126,006	4,396	14,652	1,319	1319	147
Deer ..(@1,459#)	3,239	6,015	34,241	1,851	925	
Unused yield	1,107	17,164	30,430	893	tr.	

OPTIMUM STOCKING:

	AC.1 H e a	Anim. Units	No. of Animals
cattle	31	14.32	15
Deer	14	4.88	32

CATTLE OVERHEAD ESTIMATE (A.U.):

Variable costs	\$131.60
Equip. depreciation.	72.00
Annual investments:	
Cattle	60.60
Facilities & equip.	52.80

ANNUAL NET REVENUES:

Cattle @ \$23/a.u.	\$ 329.00
Deer only lease @ \$4/ac.	1,776.00
Cattle and deer	2,105.00

Total/a.u. \$317.00

Income from calves:

calving % =	80
Av. weaning wt.(#)	500
Calf sale price(\$/#)	\$0.85

Amount = \$5,100.00

Income/a.u.	\$340.00
Annu. net revenue/a.u.	\$23.00

¹ Extrapolated from Sheffield et al. (1995)

Time demands, hunter monitoring, facility, and liability constraints may discourage departure from traditional land leasing for hunting income. Recent state legislation may provide landowners more economic incentives for wildlife management. Leasing directly to a hunting broker is one method. A broker can be made legally responsible by lease agreement to comply with landowner management prescriptions, deal with hunters, protect the land and animals, and absolve the owner **from** hunting-related liabilities. Large blocks of land may be required to attract a broker. The lease should be prepared by an attorney experienced with such arrangements.

Animal quality is mentioned as a requisite for selling high-value deer. Perhaps most of the States high-value deer are in south Texas. In general, deer are well protected there from illegal hunting, ranges are properly stocked, and have adequate forage year-round. Protection facilitates population management and assures that bucks remain on the range long enough to reach their growth potential, and consequently their income potential. Close monitoring of the land can help with protection. Good quality forage is lacking on most of the Watershed **rangelands**. Generally poor soils are one reason. **Need** for management planning is another. Forage quality and quantity can be increased in several ways. Maintenance of proper animal numbers on **rangelands** is the principal way. Treatments to increase forage quality and quantity is beneficial. **Treatments** can include rotation cattle grazing, animal dispersement strategies, prescribed burning, thinning of timber stands (mentioned earlier under Managed pine forests), and upgrading the natural food supply for deer can include favoring natural vegetation that provides important nutrition supplements. Acorns are among the most important supplements for deer (Collins, 1961; **Goodrum** et al., 1971; Short, 1976). Some species **are** better than others. Raymond **Telfair** analyzed species of oak that occur in the Watershed and ranked the acorns as to their forage value (Table 9).

Table 9. Assessment and ranking of acorns as forage for white-tailed deer. Big Cypress Bayou Watershed.¹

Oak Species	Habitat ²	Yield						Nutritional Value		Ratna	
		Lbs./ Tree/Yr.		Sound Acorns %		Sound Acorns Lbs./ Tree/Yr.		Crude Protein	Rank	Score	Rank
			Rank		Rank		Rank				
Water Oak	UL-BL	7.00 (6) ³	1	78.3	2	5.5	1	3.8	6	10	1
Overcup	BL	7.00 (±5)	1	60.0	6	4.2	2	5.7	2	11	2
Bluejack	UL	2.50 (6)	6	90.3	1	2.3	5	5.9	1	13	3
White Oak	UL	7.00 (5)	1	49.2	8	3.4	3	3.9	5	17	4
Post Oak	UL	3.10 (18)	5	61.8	4	1.9	6	4.7	4	19	5
Blackjack	UL	0.66 (18)	7	62.1	3	0.4	7	5.1	3	20	6
Willow Oak	BL	6.00 (±5)	2	56.0	7	3.4	3	2.9	9	21	7
Swamp Chestnut	BL	5.50 (4)	3	60.0	6	3.3	4	3.1	8	21	8
Southern Red Oak	UL	3.40 (18)	4	61.3	5	2.1	6	3.6	-7	22	9

¹Telfair (1995).²UL = upland; BL = bottomland.³Number of years of data is indicated in parentheses.

An activity of the Watershed reconnaissance involved development of a computer model to aid landowners in their decisions about stocking deer and cattle on rangelands (Sheffield et al., 1995). Pre-planning can be done. In addition, the model provides revenue estimates for management options. Landowners interested in this management aid can contact their local TPWD biologist.

- ◆ Request that the USCOE review their reservoir water release management. Implement procedures that will reduce stream bank erosion and optimize protection for native plants and animals that inhabit reservoir streams and their floodplains.

- ◆ Protect the ecological condition of the Watershed with a continual monitoring program. Such a program is ideal for citizen participation. Monitoring would enable the detection of environmental changes, causes of change, and where necessary, the planning of remedies. It would aid long-term development planning by providing advanced information about environmental implications from development options.

A consortium of agency and municipal representatives, interested individuals, citizen watch groups, university researchers, student mentors, and students could cooperate in comprehensive Watershed-wide monitoring. Activities of the existing multi-disciplinary water quality monitoring consortium presented by HDR and Parker (1994) might be expanded to accomplish comprehensive Watershed-wide monitoring. Cleanup and reporting of illegal dumping into waterbodies by a procedure similar to the State-wide "adopt a highway, adopt a road" program is suggested. In addition to water quality monitoring stations, permanent stations located strategically throughout the Watershed could routinely measure and record changes in air quality, climate, hydrologic conditions, soil conditions, vegetation, native animal populations, and other conditions. A Watershed-wide monitoring program portends opportunities for citizen participation, citizen awareness, university research, student studies, on-the-job technical training, jobs, sound long-range development planning, and maintenance of the Watershed's ecological health.

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